

**FY2001 PROPOSED SCOPE OF WORK for:**  
Colorado Non-native Fish Stocking Regulation Evaluation

**Project #:**106

Lead Agencies: Colorado Division of Wildlife

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Category:	Expected Funding Source:
<u>    </u> Ongoing Project	<u>  X  </u> Annual Funds
<u>    </u> Ongoing-revised project	<u>    </u> Capital Funds
<u>  X  </u> Requested New Start	<u>    </u> Other (In-kind Services)

I. Title Proposal:

Colorado non-native fish stocking regulation evaluation

II. Relationship to RIPRAP:

General Recovery Program Support Action Plan

III.A.2.c. Implement and evaluate the effectiveness of viable active control measures.

III.B.4.a.(1) Evaluate effectiveness of Colorado's stocking regulation.

III. Study Background/Rationale and Hypotheses:

The Cooperative Agreement for implementation of Procedures for stocking of nonnative fish species in the Upper Colorado River Basin was approved by the Wildlife Commission on 9/19/96, and by the Directors of the state wildlife agencies in Colorado, Utah and Wyoming, and the U.S. Fish and Wildlife Service, Region 6 on 11/06/96. The intent of the Procedures is "to reduce the potential for negative impacts on the endangered fishes in the Upper Colorado River Basin and to ensure that their recovery is not inhibited by controlling stocking and escapement of stocked, nonnative fish."

The Agreement states that the States "will ensure that all State and private stocking of nonnative fishes in the upper Colorado River Basin are in compliance with the Procedures. This will include, but not be limited to, enacting/clarifying appropriate regulations for stocking of public and private waters." The Colorado Wildlife Commission met the requirement of this Agreement on January 14, 1999 with the passage of regulatory language restricting the release of fish in waters less than 6500 ft elevation surrounding the critical habitat portions of the Colorado, Gunnison, White, Yampa, and Green rivers. These

regulations, in conjunction with the existing lake license permit regulations, serve to meet the intent of the Procedures. The Colorado Wildlife Commission conditioned their approval of the stocking regulations by requiring an evaluation of their effectiveness in achieving a biological response. The Division of Wildlife has been charged with developing the approach and criteria upon which this evaluation will be based. The Commission will review the overall effectiveness of these regulations and consider their continuation or replacement after three years of monitoring has been completed. This scope of work describes the approach and criteria.

Non-native fish species are suspected of having a significant negative impact on the current status and recovery potential of the Colorado River endangered fishes and attempts to control and minimize these impacts have been reviewed (see Tyus and Saunders 1996, Lentsch et al. 1996, Hawkins and Nesler 1991). Within the Colorado and Gunnison rivers, nonnative fish species clearly dominate the fish community of backwater habitats and comprise 90-99% of the species composition (Anderson 1997, Burdick 1995, McAda et al. 1996, McAda et al. 1994). A challenge in this scope of work will be to compare species composition, distribution and abundance between the observed field data and the public/private stocked fish data over the three-year study period to establish common species links and distinguish between natural reproduction and stocking as causative factors.

For example, two warmwater fish species of interest in this assessment are largemouth bass and fathead minnow, both commonly stocked into private fishing waters. In the Colorado River between Palisade and Rifle, Colorado, Anderson (1997) found fathead minnow comprised 21.6% of the backwater fish fauna and largemouth bass were only nominally present. In the Gunnison River between Hartland and Redlands diversion dams, Burdick (1995) found fathead minnow comprised 25-60% of the seine samples, and largemouth bass were only nominally present in electrofishing samples. In the Colorado River from Grand Junction to Loma (river miles 170-140), standardized fall seining of nursery backwater habitats from 1986-1995 showed fathead minnow represented 42-69% of the catch and largemouth bass were nominally present (McAda et al. 1996, 1994). Unpublished CDOW data from the Colorado River from Palisade to Westwater (river mile 183-130) from 1986-1991 show that 1-63 juvenile largemouth bass were collected in 22-45 seine hauls in 11-20 backwater habitats per year. These data suggest largemouth bass densities of 4-197/ac (48/ac mean) for the six years. Martinez (1998) estimated bass densities in the Colorado River (river mile 170-140) for 1992-1997 at 4-108 fish/ac (48/ac mean) of backwater habitat.

Preliminary data based on depletion sampling in Bestgen and Bundy (1998) and Martinez (1998) on largemouth bass and fathead abundance in fall nursery backwaters in 1997 in the Colorado River (river mile 185-151) demonstrated 366 bass were present in 15 of 21 backwaters, represented only 0.8% of the total catch, but resulted in estimated densities of 90 bass/ac of backwater habitat for fish <6 inches and 3 bass/ac of backwater habitat for fish >6 inches. For fathead minnow, Bestgen and Bundy estimated >1850 fish/ac of backwater habitat.

These densities may be compared to Colorado Aquaculture Board recommended stocking densities of 70-100/ac for 2-4 in. bass and 25/ac for bass >6 in., and 1000-3000/ac for fathead minnow (CAB 1997). Despite the low relative abundance of largemouth bass in backwater habitats, and the knowledge that these fish are most likely the product of

escapement of floodplain ponds rather than natural reproduction in the backwater, the estimated density of this species in nursery backwater habitat is close or equal to recommended stocking densities to establish populations of this species in ponds. For fathead minnow, natural reproduction within river habitats and current stocking/escapement rates from off-channel ponds are maintaining this species within recommended stocking densities.

#### IV. Study Goals, Objectives, End Products:

Goal: to evaluate the effectiveness of Colorado's fish stocking regulations pertaining to Colorado River endangered fishes critical habitat with respect to desired biological responses in the river fish community.

##### Objectives:

1. To determine if the administration of fish stocking regulations and permits is contributing to the reduction in riverine abundance of target fish species.
2. To monitor the trend in distribution and abundance indices for target fish species in riverine habitats and compare to concurrent public/private fish stocking data.
3. To conduct a risk analysis of non-native fish stocking in the Colorado River basin in Colorado to identify its relative significance and potential for introducing non-native fish species into the critical habitat of the endangered fishes.

##### End Product:

A final report providing the necessary justification for continuing or modifying the existing regulatory language and permit system controlling non-native fish stocking in waters of the Colorado River Basin in Colorado.

#### V. Study Area:

All river reaches in Colorado designated as critical habitat and all waters located within 6500 ft elevation surrounding critical habitat.

#### VI. Study Methods/Approach:

Control of nonnative fish in the Upper Colorado River Basin is defined as "reducing the numbers of one or more nonnative species to levels below which they are no longer an impediment to the recovery of endangered fish species" (Tyus and Saunders 1996). Control of nonnative fish within Colorado is being pursued through several approaches. These include: (1) removal of bag and possession limits on nonnative, predatory gamefish species within designated critical habitat, (2) authorization of Recovery Program participants to remove nonnative fish incidental to approved project sampling objectives through scientific collection permits, (3) removal of nonnative fish from backwater habitats in the Colorado River by seining and electrofishing, (4) removal of nonnative fish captured in the Redlands passageway on the Gunnison River, (5) removal of nonnative fish from backwater and

slough habitats in the Yampa River during spring runoff, (6) removal of nonnative fish from floodplain ponds, primarily in the Colorado and Gunnison rivers, via chemical reclamation and water level management, and (7) regulation of the release of non-native fishes via stocking into public and private waters within designated critical habitat and a buffer zone bounded by the 6500 ft elevation isopleth, and in other waters via lake licenses and stream stocking permits. Approaches 3-6 are specific projects that will be evaluated for effectiveness through catch rate indices that demonstrate depletion of target nonnative fish species and/or enhancement of native fish species in the target sampling area. Approaches 1, 2, and 7 are regulatory or opportunistic in nature, and are influenced by uncertain, and therefore uncontrolled, variability in participation, effort and evaluation criteria. Also, these regulatory approaches affect river reaches subject to one or more active nonnative fish removal projects, making their effects cumulative and difficult to separate.

The approach described in the tasks below apply to all critical habitat reaches affected by the regulation in that tracking of stocking permit applications, approvals and denials will be monitored. The focus of this monitoring and evaluation effort will be on the Colorado and Gunnison critical habitat river reaches. Reasons for this include: the potential warmwater pond resource and private water stocking potential occurs is greatest in the floodplains of these two rivers; the potential impact to endangered fish nursery habitats is concentrated in these backwater and floodplain pond habitats; and the monitoring of biological response of nonnative and native fishes to control actions is already in place via three Recovery Program projects. As such, the approach is to document (1) the extent of aquatic resources that constitute sources of nonnative fishes and receiving waters for stocked fish, (2) the waters affected by nonnative fish control actions, (3) the distribution and composition of fish species associated with source and control waters, (4) the biological response to cumulative control actions within critical habitat, and (5) the extent of private waters and business affected by the regulation and permit system. The information resulting from these data sources will subsequently contribute the necessary input to a final task using a risk assessment model developed through the Aquatic Nuisance Species Task Force and Aquatic Nuisance Prevention and Control Act of 1990. This model will be used to consolidate the overall evaluation of the biological, social, and economic elements associated with the regulation, permit system, and nonnative fish control program.

## VII. Task Descriptions and Schedule:

1. Determine number and distribution of pond, lake, and reservoir resources within 6500 ft elevation surrounding critical habitat reaches of Gunnison and Colorado rivers.
2. Determine the locations of ponds and riverine backwaters involved in nonnative fish control treatments. (Ongoing)
3. Determine species composition and stocking records of these ponds lakes and reservoirs from available records.
4. Determine distribution and/or density of regulated species within Task 1 study area and mainstem rivers from available records.

5. Determine the location of waters and species stocked by private landowners receiving DOW lake license permits. (Ongoing)
6. Determine the location of waters and species requested by private landowners for which DOW lake license permits were denied. (Ongoing)
7. Determine the change in backwater distribution and density of regulated nonnative fish species and native fish species in the Colorado River from river mile 185-152 via the backwater seining, nonnative fish control project (87B), electrofishing control project (89), and riverine monitoring of nonnative fish control in Colorado and Gunnison River floodplain ponds (CAP 18/19). (Years 2000-03)
8. Conduct a risk assessment of stocking as a significant pathway for introduction into Colorado River endangered fish critical habitat using the Generic Nonindigenous Aquatic Organism Risk Analysis Review Process (RAM Committee 1996). An outline of the application of this process follows: (\*=scored elements)

### **Risk Assessment**

- A. Need the identification of a private waters fish stocking as a pathway that may be of significant risk versus natural reproduction onsite.
- B. Identify which pathways (feral reproduction and stocking) have high potential for introducing nonindigenous fish species into critical habitat of endangered fishes.
- C. Objectives:
  1. Determine fish species associated with stocking & feral reproduction
  2. Determine numbers of fishes originating from feral reproduction and stocking within the regulated area
  3. Review present mitigating actions related to pathway stocking regulation
  4. Probability of establishing nonindigenous fish species of concern\* in river environment and critical habitat via stocking off-channel ponds and reservoirs.

#### \*Fish species of concern:

Largemouth bass	Black crappie
Bluegill	Triploid grass carp
Mosquitofish	Channel catfish
Fathead minnow	Smallmouth bass
Northern pike	Tiger muskie

#### Assessment by species\*

Scored elements and factors within elements each based on a low-medium-high rating and a five-level uncertainty rating from “very certain” to “very uncertain”. Supporting data for each rating is qualified into categories of “general knowledge-no specific source”, “judgmental evaluation”, and “extrapolation.”

1. Probability of species occurring in feral versus stocking pathways
2. Probability of species surviving escapement from ponds, reservoirs into stream or river environment
  - a. size at time of escapement
  - b. numbers escaping
3. Probability of species surviving and reproducing in river habitat/critical habitat
  - a. adequacy of food resources
  - b. abiotic and biotic environmental resistance
  - c. reproduction in new environment
4. Probability of spread of species within river system
  - a. natural dispersal
  - b. human-aided dispersal
  - c. estimated range of spread
5. Environmental consequence of establishment
  - a. Ecosystem destabilization
  - b. Reduction in biological diversity
  - c. Reduction or elimination of endangered fish species
  - d. Reduction or elimination of other native fish species
  - e. Effects of control measures
    - (1) pond reclamation
    - (2) backwater removal

- (3) stocking regulation
  - (4) unrestricted harvest in critical habitat
- f. Social influences
  - (1) Consumer concerns
  - (2) Commercial aquaculture
- g. Economic impact potential
  - (1) Value of private water fish stocking orders based on accepted/denied permits
  - (2) Value of necessary screening/berms associated with approved permits
  - (3) Value of non-native fish control efforts in associated river drainage

### **Risk Management Recommendations**

- A. Species risk assessments
- B. Available mitigation safeguards
  - 1. stocking permits
  - 2. inspection
  - 3. floodplain, screen, and berm criteria
- C. Resource limitations

### **VIII. FY 2000-01 Work:**

#### **Deliverables/Due Dates:**

- Task 1: GIS-based map of ponds, lakes and reservoirs in the Colorado and Gunnison river basins within 6500 ft elevation and associated descriptive list. (12-30-01)
- Task 2: Designation of ponds and backwaters treated within nonnative fish control projects designated on GIS map from Task 1. (Updated annually by 12-30)
- Task 3: Tabular data on species composition and species stocked for Task 1 waters suitable for selective mapping analysis by species. (12-30-01)
- Task 4. Distribution maps for 10 nonnative fish species listed in regulation within Task 1 geographic area. (Updated annually by 12-30)

- Task 5. Distribution maps for waters and species stocked under approved permits. Tabular data on species, numbers, transaction value (Updated annually by 12-30)
- Task 6. Tabular data (species, numbers, transaction value) and location maps for private waters for which stocking permits are denied. (Updated annually by 12-30)
- Task 7. Evaluate biological response in critical habitat via species composition, distribution in backwater habitats, and density of target nonnative fish species based on nonnative fish control project results and correlate to known location and nonnative fish species composition of waters within basin, to location of pond reclamations, and to location and numbers of fish stocked under approved permits. (Due 6-30-03, part of final report)
- Task 8. Risk assessment report. (Due 6-30-03, part of final report)

IX. Budget Summary:

FY 2000/01: All tasks.

Personnel: 1.0 FTE	\$30,000.00
Hardware: Computer (min. 800MHz, 256K, Win 2000P, NT5.0)	\$ 4,000.00
Plotter	\$ 4,000.00
Software: ARC INFO	\$ 8,500.00
ARC Maintenance agreement	\$ 1,500.00
Supplies: Office	\$ 150.00
Computer	\$ 500.00
Services: Postage/shipping	\$ 150.00
Existing coverages (photographic, printing, digital)	\$ 2,000.00
Expenses: Travel	\$ 1,500.00
Training	\$ 1,500.00
	<u>\$ 1,500.00</u>
TOTAL	\$53,800.00

FY 2001/02 and 2002/03: All Tasks.

Personnel: 1.0 FTE	\$31,000.00
Software: ARC Maintenance agreement	\$ 1,500.00
Supplies: Office	\$ 150.00
Computer	\$ 500.00
Services: Postage/shipping	\$ 100.00
Existing coverages (photographic, printing, digital)	\$ 1,000.00



Expenses: Travel	\$ 1,000.00
Training	<u>\$ 1,000.00</u>
TOTAL	\$36,250.00

X. References:

Anderson, R. 1997. An evaluation of fish community structure and habitat potential for Colorado squawfish and razorback sucker in the unoccupied reach (Palisade to Rifle) of the Colorado River, 1993-1995.

Burdick, B. D. 1995. Ichthyofaunal studies of the Gunnison River, Colorado 1992-1994. Final report. Colorado River Fishes Recovery Program, U. S. Fish and Wildlife Service, Grand Junction, Colorado.

(CAB) Colorado Aquaculture Board. 1997. Colorado fish pond management guide: the commonly asked questions. Colorado Department of Agriculture, Lakewood. (Leaflet)

Lentsch, L. D., R. T. Muth, P. D. Thompson, B. G. Hoskins, and T. A. Crowl. 1996. Options for selective control of nonnative fishes in the upper Colorado River Basin. Final Report. Utah Division of Wildlife Resources Publication No. 96-14. Utah Division of Wildlife Resources, Salt Lake City.

Martinez, P. J. 1998. West slope warmwater fisheries. Job progress report. Federal Aid Project F-325-R2, Job 1, Objectives 1-3. Colorado Division of Wildlife, Fort Collins. 128pp.

McAda, C. W., T. E. Chart, M. A. Trammell, K. S. Day, P. A. Cavalli, and W. E. Elmblad. 1996. Interagency standardized monitoring program, summary of results, 1995. Colorado River Endangered Fishes Recovery Program, U.S. Fish and Wildlife Service, Denver.

McAda, C. W., J. W. Bates, J. S. Cranney, T. E. Chart, W. E. Elmblad, and T. P. Nesler. 1994. Interagency standardized monitoring program, summary of results, 1986-1992. Final report. Colorado River Endangered Fishes Recovery Program, U.S. Fish and Wildlife Service, Denver.

Risk Assessment and Management Committee. 1996. Generic nonindigenous aquatic organisms risk analysis review process. Report to the Aquatic Nuisance Species Task Force. 24pp.

Tyus, H. M. and J. F. Saunders, III. 1996. Nonnative fishes in the Upper Colorado River Basin and a strategic plan for their control. Final report. Coop. Agreement 14-48-0006-95-923. U.S. Fish and Wildlife Service, Denver. 85pp.

XI. Reviewers:

Suggested: K. Christopherson, P. Dey